

<i>Delaware.</i> —25th, 28th.	<i>Montana.</i> —19th, 20th, 27th, 30th, 31st.
<i>District of Columbia.</i> —5th to 7th, 24th to 26th.	<i>Nebraska.</i> —6th, 11th to 16th, 20th to 27th.
<i>Florida.</i> —5th to 14th, 18th, 20th to 24th, 26th to 31st.	<i>Nevada.</i> —17th to 19th, 23d, 24th, 30th, 31st.
<i>Georgia.</i> —5th, 8th to 12th, 18th to 21st, 23d to 26th, 30th, 31st.	<i>New Hampshire.</i> —10th, 18th, 25th to 27th.
<i>Idaho.</i> —24th.	<i>New Jersey.</i> —3d, 5th to 8th, 11th, 24th to 29th.
<i>Illinois.</i> —1st to 5th, 9th, 10th, 12th to 17th, 21st to 24th, 29th to 31st.	<i>New Mexico.</i> —15th to 18th, 20th, 25th to 27th.
<i>Indiana.</i> —1st to 6th, 10th to 13th, 17th, 21st to 24th, 30th, 31st.	<i>New York.</i> —1st to 3d, 5th to 8th, 19th, 24th to 28th.
<i>Indian Territory.</i> —9th to 12th, 14th to 16th, 20th to 24th, 26th, 27th.	<i>North Carolina.</i> —6th to 10th, 12th, 13th, 19th to 21st, 23d to 27th, 31st.
<i>Iowa.</i> —1st, 2d, 9th to 15th, 21st, 22d, 26th, 29th.	<i>Ohio.</i> —1st to 13th, 21st to 25th, 30th, 31st.
<i>Kansas.</i> —1st, 10th to 16th, 20th to 28th.	<i>Oregon.</i> —17th, 18th, 22d to 24th.
<i>Kentucky.</i> —1st, 3d to 8th, 10th to 14th, 17th, 22d to 26th, 30th, 31st.	<i>Pennsylvania.</i> —1st to 3d, 5th to 8th, 11th, 21st, 24th to 28th, 30th.
<i>Louisiana.</i> —3d, 8th, 10th to 13th, 15th, 17th to 19th, 23d, 27th to 31st.	<i>South Carolina.</i> —5th to 13th, 18th to 20th, 22d to 26th, 30th, 31st.
<i>Maine.</i> —23d, 26th, 27th.	<i>Tennessee.</i> —2d to 4th, 6th to 10th, 12th, 15th to 26th, 29th to 31st.
<i>Maryland.</i> —3d to 8th, 24th to 26th, 28th.	<i>Texas.</i> —1st to 3d, 8th to 31st.
<i>Massachusetts.</i> —6th to 8th, 22d, 25th to 28th.	<i>Utah.</i> —11th, 18th, 20th.
<i>Michigan.</i> —1st to 3d, 5th, 8th, 9th, 11th, 16th, 17th, 20th to 25th, 29th to 31st.	<i>Vermont.</i> —10th, 25th to 27th, 30th.
<i>Minnesota.</i> —1st, 5th, 19th, 20th, 23d, 28th to 30th.	<i>Virginia.</i> —6th to 10th, 12th, 19th, 20th, 23d to 26th, 28th, 30th.
<i>Mississippi.</i> —19th, 26th, 29th, 30th.	<i>Washington Territory.</i> —7th.
<i>Missouri.</i> —1st to 4th, 10th to 17th, 21st, 22d, 24th to 27th, 29th.	<i>West Virginia.</i> —4th, 6th, 7th, 9th, 12th, 20th, 21st, 23d to 26th, 30th, 31st.
	<i>Wisconsin.</i> —2d, 13th, 14th, 21st to 23d, 29th, 30th.
	<i>Wyoming.</i> —11th, 12th, 15th, 18th, 24th, 27th, 31st.

OPTICAL PHENOMENA.

HALOS.

The following may be stated in regard to halos observed during May, 1887:

From the 1st to the 6th solar and lunar halos were quite generally reported from all districts east of the Mississippi, the stations reporting lunar halos being much more numerous than those reporting solar halos. During the greater part of this period the storm described as number ii under "Areas of low barometer" was advancing from the lower Rio Grande valley to northern Illinois, the halos being observed to the east and south of an area of complete cloudiness, and in the region in which cirrus and cirro-stratus clouds were generally observed.

During the period from the 6th to 13th but few solar or lunar halos were reported, and those observed were noted mostly at scattering stations to the west of the Mississippi River and in the Pacific coast districts.

On the 14th solar halos were observed in California, Oregon, and Idaho, and also in Kansas, to the east of an area of complete cloudiness covering portions of Colorado, Kansas, and Indian Territory.

Solar halos were observed on the 15th in California, Nevada, Arizona, Indiana, and New York, and on the 16th at scattering stations in the Lake region. The period from the 17th to 25th was one during which but few halos were seen, and those at scattering stations to the west of the Mississippi.

On the 26th solar halos were reported from the north Pacific coast, and lunar halos from Illinois, Indiana, and Ohio.

Both solar and lunar halos were reported on the 28th from numerous stations in the Mississippi Valley, and on the 29th from the Lake region, Ohio Valley, and south Atlantic states; these were followed on the 29th and 30th by the cloudy and rainy weather which attended the storm described as number x under "Areas of low barometer."

The phases of the moon, Washington mean time, during May, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 22d, 5 h. 57.3 m.; first quarter, April 30th, 5 h. 52.1 m.; full moon, 6th, 20 h. 53.3 m.; last quarter, 14th, 3 h. 9.3 m.; perigee, 5th, 1.2 h.; apogee, 17th, 0.9 h.

MIRAGE.

Fort Stanton, N. Mex.: a mirage was observed at sunset on the 19th; the Sierra Blanco Mountains, lying west of here, were plainly seen outlined in the base of a large cumulus cloud in the southeast.

Mirages were also reported to have been observed at the following places:

Parkston, Dak., 1st, 3d, 20th, 24th, 28th; Webster, Dak., 9th, 18th; Salina, Kans., 23d to 25th; Reidsville, N. C., 20th; Spartanburg, S. C., 15th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Owing to the small amount of rainfall in April and May, 1887, over a large part of the country, prairie and forest fires have prevailed to great extent. These fires have caused the destruction of property of immense valuation, especially in the lumber regions of Michigan, where the losses are estimated at millions of dollars.

Heavy losses have also resulted from forest fires in Massachusetts, New York, Pennsylvania, Wisconsin, and Dakota.

Of the reports received concerning the forest and prairie fires of May, 1887, the following are given:

Dakota.—Grand Forks, Grand Forks Co., 9th: a fierce prairie fire burned over a considerable area fifteen miles north of this place, endangering the settlements in that region. A large elevator of the Minneapolis and Northwestern Elevator Company was destroyed.

Minnesota.—Saint Vincent, 7th: at 11.40 a. m. a gale set in from the south; at the same time extensive prairie fires were

noticed on the southern horizon. The wind continued from the south during the day, causing the fire to make great progress; everything in its path, which is estimated to be about ten miles in length, was consumed; several dwellings, with out-buildings, were burned, together with many hay-stacks, farming implements, etc.

Brainerd, Crow Wing Co.: the forest fires which destroyed large areas of pine timber along the Mississippi eastward from Brainerd, were extinguished by the rain on the night of the 13-14th.

Michigan.—The Signal Service observer at Marquette reports as follows:

On nearly every day from the 5th to 24th the atmosphere was filled with smoke from forest fires to the south. On the 12th the fires extended along the Mackinaw division of the South Shore Railroad from Sand River to Reeds-borough, a distance of fifty miles. On the 18th and 20th high westerly winds, attaining a maximum velocity of twenty-two miles per hour, caused the flames to spread rapidly and approach within two miles of Marquette. On the 22d a high southwest wind was accompanied by light rain from 1.08 to 1.40 p. m., but the precipitation produced no effect upon the fire, which at that time covered miles of country. Light rain fell during the night of the 23d-24th, in the afternoon of the 24th and until 9.30 p. m. of the 25th, effectually quenching the fires in this section.

Escanaba: from the 6th to the 22d no rain fell; during this time forest fires were burning over the surrounding country and the air was filled with smoke, which at times was so dense as to seriously affect the navigation on this end of the lake. On the 22d light rain fell for several hours, and heavy rain during the nights of the 22-23d and 23d-24th, completely extinguishing the fires, which had by this time spread over a large part of the upper peninsula and destroyed a vast amount of timber and other property.

Grand Haven, 12th: forest fires are burning in the Cadillac district, one hundred miles northeast of station.

Cheboygan, Cheboygan Co., 15th: a dense smoke, caused by forest fires, covers this section. The fires are raging in the southern part of this county where much valuable timber has been destroyed.

The following is from the "New York Sun" of May 16, 1887:

MARQUETTE, MICH., May 14.—The fog horn here has sounded for three days and three nights continuously, and is still at it. Dense smoke covers the shores and lake. The forest fires are widespread, and cover every quarter of the peninsula. There has been no wind at all for three days, but to-day it is blowing very fresh from the south, and reports of losses will probably pour in to-night. Several towns have been saved with difficulty. A force of men are fighting fire all over the peninsula. Much valuable pine has been destroyed. Everything is terribly dry in this city and vicinity. There are no fires within eight miles of Marquette.

The "Buffalo Commercial Advertiser" of May 28, 1887, contained the following:

CHICAGO, May 28.—The Marquette correspondent of the "Times," in a dispatch about the forest fires, says a careful estimate puts the total loss at \$7,000,000, including \$2,500,000 caused by the destruction of the town of Lake Linden. Eight lives are positively known to have been lost. Great destitution prevails throughout the burned district.

New York.—Catskill, Green Co., 6th: on this date an extensive fire, which originated near Palenville, destroyed much timber and caused great alarm at the hotels in the Catskill Mountains. One man was fatally burned and several persons were burned more or less seriously.

The following is from the "New York Tribune" of May 24:

KEATING, N. Y., May 23.—The protracted dry spell has reduced the woods in this section of the country to the condition of tinder, and as a result a most disastrous forest fire is raging. Last week a spark started a fire near Liberty Station, on the Buffalo, New York, and Philadelphia Railroad, which has been increasing in fury ever since and is now entirely beyond control. George D. Briggs has lost nearly 4,000,000 feet of logs, cut and peeled and ready for the mill, besides acres of standing timber. It will require a heavy rain to check the progress of the flames.

Bolton, Warren Co.: on the 26th and 27th one of the most extensive forest fires of many years occurred in the vicinity of Buck Mountain. Owing to the drought which prevailed during the month the timber and undergrowth were very dry and the flames spread rapidly.

Pennsylvania.—Wellsborough, Tioga Co.: from the 10th to the 20th quite extensive forest fires were burning over the southeastern part of this county; but little damage was done, except one hundred and fifty cords of wood and a small quantity of bark, for tanning purposes, were destroyed.

Clarion, Clarion Co.: on the 22d forest fires were burning in several places near this town and caused considerable damage to timber, especially pine.

Altoona, 22d: a telegram was received in this city this evening from Houtzdale, Clearfield Co., stating that forest fires were raging all around them, and that the town was in imminent danger of destruction.

Maine.—Portland, 12th: a large tract of land has been burned over near Yarmouthville, Cumberland Co., causing damage to the extent of seven thousand dollars.

Massachusetts.—Wood's Holl: on the afternoon of the 12th the atmosphere was filled with dense smoke from forest fires, which were burning in Barnstable county, near the towns of Bourne, Wareham, Sandwich, and Falmouth. The fires continued until the 14th, burning over nearly ten thousand acres of woodland, and entailing a loss of \$30,000. The fire is supposed to have been started by sparks from a locomotive on the Old Colony Railroad.

Milford, Worcester Co., 12th: a forest fire has in two days burned over 2,000 acres of sprout land in this vicinity.

Sandwich, Barnstable Co., 12th: forest fires burned over several thousand acres in this county on the 11th and 12th. The path of the fire was about ten miles in width and fifteen miles in length.

Forest or prairie fires occurred also at the following places:

Fort Bowie, Ariz., 3d; North Platte, Nebr., 6th, 9th, 12th; Saint Vincent, Minn., 9th to 11th, 13th; Yankton, Dak., 11th; Harvard, Nebr., 17th; Clayton, N. J., 12th.

INSECTS.

Reports from Columbia, S. C., on the 22d, stated that numerous villages and towns in the eastern part of the state were infested with caterpillars which have caused much injury to trees and shrubbery. The insects are reported to have been of a different variety from those which have usually appeared at this time of the year. On the Atlantic Coast Line Railroad the rails on the trestles over the Great Pedee swamps were so covered with caterpillars as to impede the progress of trains and make it necessary that the rails be swept.

Dayton, Ohio, 23d: potato bugs are to be found in great numbers in this vicinity, portions of some farms being literally covered with them.

Quakertown, Bucks Co., Pa., 26th: potato bugs are numerous in this vicinity; other insects have caused injury to currant and gooseberry bushes.

Yates Centre, Woodson Co., Kans., 31st: chinch bugs very numerous during the month and caused great damage to corn.

Harvard, Clay Co., Nebr., 31st: chinch bugs are damaging the crops in this section; barley and wheat are suffering the most serious injury.

Washington City: during the month myriads of caterpillars have appeared on the trees and shrubbery in the parks and throughout the city. These insects have blighted the foliage of trees, etc., to such an extent that the parking authorities and citizens have resorted to pruning and other means of destroying them in order to check their ravages.

METEORS.

Willows, Colusa Co., Cal.: at 8.45 p. m. on the 9th a meteor of unusual brilliancy was observed from a point about two miles east of Willows. The meteor passed so close to the observer that the hissing noise emitted by it frightened the horse he was driving, and the illumination was so bright that the smallest objects on the ground could be distinctly seen.

Monticello, Jones Co., Iowa: a meteor of unusual size was observed, moving from southwest to northeast, at this station at 3 a. m. of the 22d.

The following report is taken from the Rochester "Democrat and Chronicle" of May 28, 1887:

WELLSBURG, N. Y., May, 27.—A meteor of extraordinary size fell on the farm of Jas. Harney at Lowhamville, Thursday night. As the stone is buried quite deep it is impossible to tell its exact dimensions. Its descent occurred about 11 o'clock at night and was observed by Robert Wells, a farmer, who had just returned from Elmira. Wells was first startled by the brilliancy of the sky, as if there was a prolonged flash of lightning. Then there was a loud hissing sound and he saw a huge ball of fire, which he thought struck near, but it was so dark after the stone fell that he abandoned the effort to find it.

This morning a mysterious pit forty feet across and twenty feet deep was discovered in a ten acre field on Mr. Harney's farm a mile away. The sides have caved in, but an effort will be made to find the meteor, which, from all accounts, is a large one. The Harneys say the house was severely jarred during the night and think it must have been caused by the meteor striking so near them.

Meteors were also reported during the month as follows:

Limona, Fla., 1st; Logansport, Ind., 6th, 13th; Manatee, Fla., 6th, 15th; Sanford, Fla., and Pekin, Ill., 8th; Factoryville, N. Y., 9th; Marion, Va., 11th; Aiken, S. C., 15th; Woodstock, Md., 16th, 20th; Clayton and Egg Harbor City, N. J., 18th; Nashau, N. H., 19th; New Haven, Conn., 20th; Kalamazoo, Mich., 21st, 22d; Riley, Ill., Elkin, Ky., and Dover, N. J., 23d; Stateburg, S. C., 25th; Omaha, Nebr., 26th; Boise City, Idaho, 28th; Cleburne, Tex., 30th.

MIGRATION OF BIRDS.

Geese flying northward.—Red Bluff, Cal., 1st, 3d; Tatoosh Island, Wash., 1st to 6th, 8th, 12th, 17th, 18th, 27th, 29th, 30th.

Geese flying southward.—Duluth, Minn., 10th; Fort Custer, Mont., 28th.

Ducks flying northward.—Tatoosh Island, Wash., 1st to 8th, 13th to 15th, 17th, 18th, 24th to 27th, 29th, 30th.

Cranes flying northward.—Rappahannock, Va., 16th, 19th, 21st.

POLAR BANDS.

Polar bands were reported from the following stations:

Napoleon, Ohio, 1st, 2d, 6th, 29th; Wauseon, Ohio, 2d, 12th; Sacramento, Cal., 3d; Archer, Fla., 3d, 4th, 11th, 25th, 28th, 29th; Montrose, Colo., 4th, 17th, 24th, 26th; Nashville, Tenn., 5th; Lead Hill, Ark., 7th; Centreville, Mo., 8th; Ninnescah, Kans., 20th; Blakely, Wash., 22d; Salina, Kans., Fort

McDowell and Fort Mojave, Ariz., 26th; Dale Enterprise, Va., 30th; Gardiner, Me., 31st.

SAND STORMS.

Fort Maginnis, Mont.: at 9 p. m. of the 7th the air was filled with dense clouds of sand, rendering it almost impossible to face the wind. At 4 p. m. of the 10th the wind was blowing a gale and the air became so densely filled with sand that the sun appeared like a large ball.

Saint Vincent, Minn., 2d: at 6.35 a. m. a gale set in from the northwest, attaining its maximum velocity, thirty-eight miles from the northwest, at 3.35 p. m., and ending at midnight. During the afternoon clouds of dust and sand were raised by the wind, rendering travel on foot and in vehicles difficult and uncomfortable, and causing a general suspension of work among farmers and laborers. During the afternoon of the 7th a sand storm occurred, which was more severe than that on the 2d instant; the air was so full of smoke, sand, dust, and burnt prairie grass that persons caught in it could not see ten feet from them.

Sand storms also occurred at the following places:

Pekin, Ill., 2d; Fort Yates, Dak., 10th, 29th; Fort Grant, Ariz., 16th; Yuma, Ariz., 17th, 18th; Fort McDowell, Ariz., 26th, 27th, 29th; Spartanburg, S. C., 27th.

SUN SPOTS.

Mr. John W. James, voluntary observer of the Signal Service at Marengo, McHenry Co., Ill., reports having observed sun spots as follows:

An unusually large spot appeared on the sun's east limb on the 3d; it was on the sun's meridian on the 7th when it had a diameter of 37,800 miles; this spot disappeared by solar rotation on the 13th, and had entirely vanished when due again on the east limb; On the 16th and 17th a large group of spots broke out on the sun's west quadrant, disappearing by solar rotation on the 22d; this group contained two large, and twenty-one small spots, and was estimated to have been 118,000 miles long with a width from one-fourth to one-third as great as the length. No sun spots were seen after the 23d.

Mr. H. D. Govey, of North Lewisburg, Champaign Co., Ohio, reports sun spots were observed from the 2d to 4th, on the 10th, 13th, 15th, 18th, and from 20th to 27th.

VERIFICATIONS.

INDICATIONS.

The predictions for May, 1887, were made by 1st Lieutenant Robert Craig, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant; the verifications were determined by 2d Lieutenant Frank Greene, Signal Corps, U. S. Army, Assistant, as follows, viz.: for North Carolina and Wisconsin, from May 1st, 7 a. m. to May 14th, 3 p. m., inclusive; for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, east Florida, lower Michigan, and Iowa, from May 1st, 7 a. m. to May 21st, 3 p. m., inclusive; and for all other states and districts from May 1st, 7 a. m. until May 24th, 7 a. m., inclusive. The remainder of the verifications for the month were determined by 2d Lieutenant John P. Finley, Signal Corps, U. S. Army, Assistant.

The detailed comparison of the tri-daily indications for May, 1887, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 68.51.* The percentages for the different elements are: Weather, 67.83; wind, 66.90; temperature, 69.76. By states, etc., the percentages are: For Maine, 67.59; New Hampshire, 68.20; Vermont, 69.25; Massachusetts, 69.26; Rhode Island, 66.14; Connecticut, 68.30; eastern New York, 71.08; western New York, 69.29; eastern Pennsylvania, 67.07;

western Pennsylvania, 71.25; New Jersey, 67.64; Delaware, 64.43; Maryland, 67.76; District of Columbia, 64.96; Virginia, 69.55; North Carolina, 68.32; South Carolina, 68.27; Georgia, 69.55; eastern Florida, 64.06; western Florida, 64.11; Alabama, 66.76; Mississippi, 67.90; Louisiana, 70.78; Texas, 76.08; Arkansas, 63.03; Tennessee, 63.44; Kentucky, 72.06; Ohio, 73.16; West Virginia, 74.65; Indiana, 72.11; Illinois, 71.05; lower Michigan, 73.51; upper Michigan, 65.48; Wisconsin, 66.05; Minnesota, 65.70; Iowa, 69.78; Kansas, 67.19; Nebraska, 75.65; Missouri, 66.75; Colorado, 69.11; eastern Dakota, 70.24; Washington Territory, 74.65; Oregon, 74.12; northern California, 80.39; southern California, 83.90.

There were ten omissions to predict, out of 8,529, or 0.12 per cent. Of the 8,519 predictions that have been made, seven hundred and seventy-six, or 9.11 per cent., are considered to have entirely failed; six hundred and fifty-eight, or 7.72 per cent., were one-fourth verified; 1,971, or 23.14 per cent., were one-half verified; 1,827, or 21.45 per cent., were three-fourths verified; 3,287, or 38.58 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during May, 1887, it was practicable to determine the verifications of thirty-two; of these, twenty-four, or 75.00 per cent., were fully verified both as to direction and velocity. No direction or on-shore signals were ordered during the month. Number of signals

*In determining the general average percentage of verifications the Pacific coast districts have not been included.